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ABSTRACT

Although there are many retrospective accounts from teachers and professional writers concerning the effect of computers on their writing, there are few real-time accounts of students struggling to simultaneously develop as writers and cope with computers. To fill this void in "testimonial data," a study examining talking-aloud protocols from a freshman in an introductory composition course. The student, whose initial writings were typical of a freshman writer, used the PC-Write 2.6 word processing program, with its extensive on-line help screens and an invention tutoring program called QUEST. Once a week the student came to the computer lab and verbalized her thoughts into a tape recorder while writing. Findings indicated that the student exhibited very little of the "user-friendly fallacy," the assumption that the machine shares the user's world views and that the computer will assume responsibility for the topic of the paper. The student did have trouble operating the computer at first, and she expressed irritation. Later, problems disappeared, but the student did not take advantage of advanced functions, instead using the computer as a glorified typewriter. Also, computer trouble often interrupted her progress when using the invention tutor. Her writing improved, however, and the computer tutoring was useful, if not a complete substitute for the kind of tutoring humans can provide. (References and samples of the student's interactions with QUEST are appended.) (SKC)

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COMPUTER-TUTORS AND A FRESHMAN WRITER: A PROTOCOL STUDY

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Paper Presented at the

New York College Learning Skills Association

(NYCLSA)

Annual Symposium

Rochester, New York

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COMPUTER-TUTORS AND A FRESHMAN WRITER: A PROTOCOL STUDY [1]

Ken Autry (1985) makes a wry observation that every computer book these days must have an obligatory "testimonial," a chapter of personal confessions from a convert to word-processing that "begins with an avowal of former ignorance about computers and moves on to the sudden revelation of seeing the first electronically-honed page reel out of the printer" (p. 72). The "testimonial" genre continues: I just recently reviewed a manuscript about word-processing titled "Composing at the Word Processor: Confessions and Comment" (italics mine), co-authored by Kevin Davis, Wendy Bishop, and Penny Smith (1987). I have no problem with these confessions, serving, as they do, to celebrate the role of the computer in our brave new world. I am, however, bothered on two different points by these essays. First, they are testimonials from teachers, not students. Second, they are retrospective accounts of the conversion, usually fictionalized re-creations based upon present knowledge, often delivered with the fervor of St. Paul.

Teachers of writing are open to conversion: they are already convinced of the value of writing, armed with a number of writing strategies, and adept at new learning. In the three years I have been at Slippery Rock University, I have personally "converted" five faculty in my department. I am not surprised by this. I am, however, surprised by the number of students who have also been given the "keys to the kingdom," joining the ranks of the computer-literate, seeing themselves as

members of a community of writers.

Retrospective accounts involve selection, a filtering of experience. They are highly susceptible to exaggeration or minimalization, the influence of the affective domain upon episodic memory. Retrospective accounts change over time. Some of us remember how difficult it was to learn to drive a car; others remember the natural ease with which we took to driving. I suspect the experience was essentially the same for both groups.

We have a wealth of retrospective accounts from teachers and professional writers concerning the effect of computers on their writing. What we lack are real-time accounts of students--struggling to develop as writers, coping as computer novices.

In an attempt to fill this void in "testimonial" data, I conducted a protocol study this year, collecting talking-aloud protocols from a freshman in College Writing I, the first of a two course sequence required of all students. This study, differing as it does from an empirical study I did earlier (Strickland, 1984), does not have hundreds of pre and post results to compare. Rather, the protocol study follows a student writer in real-time use of computer tutors, software programs that guide the writer interactively while she freewrites with a word-processing program and generates ideas with an invention program.

I chose PC-Write 2.6 as the word-processing computer tutor because, unlike many other word-processing programs, such as Perfect Writer, a program favored at our University, it does not require that an unfamiliar user memorize commands or employ trial and error to use it efficiently. This word processing program

qualified, in my mind, as a computer tutor because it offered on-line help with 40 topics, each screen teaching an average of a half-dozen operations.

My invention tutor was a revised version of my original computer-assisted heuristic program, QUEST, rewritten for the IBM-PC (Strickland, 1984).

I began the semester by teaching the entire class, 25 students in College Writing, how to use the PC-Write 2.6 word-processing, a program I had put on their disks for them. I gave them a single-page hand-out to follow and let them proceed. Later in the semester, after discussing invention strategies in class, I gave the class another handout telling them how to use my invention tutor, QUEST, having included the program on their word-processing disks.

I took a closer look at one freshman, Leslie. She impressed me as independent, perhaps because she was two years older than her classmates. A writing sample written the first week of class showed that she was a typical freshman writer--narrowly concerned with surface correctness, uneasy about her own writing abilities, anxious about a semester of "college" writing. She asked me after class if she could learn more about writing with the computer. I asked her if she would be willing to help with something I was doing, explaining that I was interested in seeing how students experience writing with a computer and that I would like to tape-record her working at the computer. I explained what a talking-aloud protocol was, that she was to verbalize everything as she was thinking it or as she was reading it. I told her that I was interested in seeing her in the act of writing, hearing what she thought and did while using the

computer, learning what she found difficult. I told her not to worry about sounding "stupid," because I was interested in knowing what students had trouble with. If I could better anticipate their problems, I told her, then ultimately I could be a better teacher. She agreed to come regularly one evening a week, when the department would be relatively free from distractions, the teachers and students gone to their evening classes and the department's computer free. I was not able to find anyone else in my class of twenty five who was both willing and dependable enough to participate under these conditions.

During the protocol sessions I told Leslie to say everything she was thinking, whether or not she thought it was important or relevant; this way I was able to hear her work through the entire writing process--from generating ideas to processing lower-order concerns, spelling and proper keystrokes. I recorded her day-dreaming--reading the items on the bulletin board and telling stories as she made associations with thoughts she had written on the screen. When she was familiar with the routine, she forgot about the recorder and about my listening to her tape. She revealed surprising personal things about herself: an affair with her boss when she was young and foolish, her feelings about her recently-widowed mother dating. Another night I found her crying because of memories triggered by a writing about her father, who had died a year ago. Only at the end of the semester did she seem to realize how much she had revealed, saying to me after class one day, "I bet you know an awful lot of personal things about your students; they write all kinds of things in their essays and journals," an indication that she had not been monitoring her protocols.

User-friendly fallacy. John Seely Brown and Richard R. Burton (1975), Artificial Intelligence researchers, observe that when "a person communicates with a logically intelligent system, [the person] inevitably starts to assume that the system shares his world-view" and follows the interactive dialogue. I wondered how severe a problem mistaken expectations about computer tutors would be for Leslie and her classmates. For example, when the invention-tutor program asks students an explicit question about their topic--gun control, higher education, animal experimentation--do the students really expect the computer tutor to know about the topic? When students are asked questions by tutors in any other situation, a writing conference for instance, it is not unreasonable to assume the questioner understands the topic. Is it unreasonable for the student to assume that a computer tutor should also have some knowledge?

Fred Kemp (1987) calls this phenomenon the "user-friendly" fallacy. His notion is that we are doing a disservice to our writers when we try to make our tutoring programs "user-friendly," giving writers the sense that the computer is something other than what it is, a machine that is impressive at low level activities--counting, following orders, capturing keystrokes--but unintelligent about the discourse it displays on its screen. The computer is not a person and nothing is gained by the computer pretending to be a person. A classic film, 2001: A Space Odyssey, caught everyone's imagination when it featured a computer named "HAL", a computer capable of thinking and feeling as a person. "HAL" has haunted our computer software since 1970. We labor to fool our students into thinking the computer is a person--which it isn't--and that the computer understands what

the student types--which it doesn't--and that the computer is more of an authority on matters than the student is--which it isn't. The user-friendly fallacy leads students to expect an intelligent tutor and delivers the electronic equivalent of a dumb blonde--impressively packaged but internally vacuous.

A second aspect of the user-friendly fallacy, not discussed by Kemp, is the expectation that the tutor will assume responsibility for the topic. When I did my original computer study (Strickland, 1984), the students commented a number of times that they expected the computer to help them in the sense of suggesting topics to them or giving them ideas about their topic. I explained to those students that an invention-tutor would help, but they were expecting a sophistication Artificial Intelligence programmers are only now investigating. With Leslie, I wanted to see how much her expectations about computer tutors influenced their effectiveness, and I wanted to see how helpful the programs were when correctly asked.

Other questions. When I began the study, I was interested in seeing if writers would have operational difficulties and/or rhetorical difficulties. I deliberately made my instruction time as brief as my handout because I was interested in seeing how little instruction was needed to use computer tutors, word-processing and invention programs, in composition classes. I wanted to know if writers were able to operate the computer tutor in a computer lab without need of a lab assistant. In addition to noting ease of use, I also wanted to evaluate the rhetorical value of using the computer tutors. I had a hunch that the features of word processing would encourage writers to revise and edit. I also thought that the invention programs would be able

to pose heuristic questions in a sensible way. I further hoped to evaluate whether the combination of word-processing and invention programs encouraged the transfer of material to successive drafts.

Also of interest was the question of how much time is needed to see an improvement. In my earlier study, I concluded that a semester is really not long enough to see beneficial changes in the drafts of a writer using invention strategies. I hoped the protocol study would allow me to see if this was a plausible explanation for the "no significant difference" findings of my study and those of others before me (Burns 1979, Schwartz 1982).

Observations from the protocols. My protocol analysis showed very little of the user-friendly fallacy. Leslie seemed to be engaged by the interactive invention tutor, answering questions as they were asked of her, commenting, "That's nice," when the computer complimented her by name, "Okay, Leslie. You're doing terrific." Yet in her protocols she never seemed to indicate that she believed the computer to be intelligent or that she felt engaged with another person. At one point she does say of the computer tutor, "Oh, I see how this works"--her use of the pronoun "this" distancing herself from the machine. Moreover, she did not indicate by anything she said that she expected the computer to give her a topic or to tell her what to write about. The first time she used the invention tutor, it asked her what she would like to be called; she answered "Honey," (she had been a waitress) and everytime the computer called her "Honey," she read the remark or question in a normal tone of voice, neither endeared nor insulted by the familiarity. The next time, however, she instructed the computer to call her "Leslie,"

affirming by this formality that she was addressed by a machine rather than a person.

Operational difficulties. Leslie did have trouble operating the computer the first time she used the word-processing program and the first time she used the invention program. The first protocol she did is fraught with frustration. She loses her confidence with file management,saying:

> "Start again...Alt,Control,Delete. Okay. The first problem with this computer is not being real good on how to run it. And that creates a problem right off the bat. Right now I'm thinking how much time I'm wasting because I screwed it up. And now I'm starting all over again."

Trying to insert a comma, she says,

> "...let's see...[typing] I know a lot of people who are educated. However... however, they are...I know a lot of people who are...oops, I've got to back up....who are...comma...who are...comma. I'm messing with this computer...I want to go back. I want to take everything back one space and I don't know how to do that. It makes me so angry when I can't do this...I hate this when it happens because I cannot get this to go back right and it makes me really, really angry...What is this little mark that I made? I made it when I pushed the <alt> button, and I hate that because now it looks like this whole line is really messed up, and I'm really mad about that. I'm just going to erase it all because it keeps doing that. The only thing I tried to do is, I tried to go back and put a comma in..."

Her frustration with inserting that comma shifted her attention from high-order idea generating to low-order production, and, when she

returns, says she's forgotten her idea:

> "[typing again]...I know a lot of people who are...comma... and then it just got messed up after that. And that's how long it took me, and I've just erased it so that I can start again.... who are...space...Now I've forgotten even what I had written."

And when she loses her file, she voices an important difference between pen & paper and computer: she can't lose pen & paper.

> "See, it's gone, because I didn't save that. See, now I'm totally frustrated because now everything on there is gone, and I don't have it written down on my pencil and paper because I didn't do that part. I was writing this from my head and I was getting into it, too. I don't believe this. Hold on. I'm going to push escape, and I'm going to look for F9. I want to find text...F9. No. What a drag. "I don't believe this. It's gone. Oh, no! I'm going to cry right now...I want to cry because this is frustrating. See; I would rather not use this computer than have this happen, because right now I'm lost. I don't believe it. I don't know. It's just amazing that it could be...stop save, push F9. I don't know. I can't believe that that's gone, if you want to know the truth."

The first experience she has with word-processing and computers closes on a note of frustration, both with composing at the terminal and with freewriting.

> "See, right now I only have about...I don't know... 1,2,3,4,5,6,7,8,9,10,11,12,13...I only have 13 lines and it's 6:30, so I think that's a drag. I mean, I don't have very much written at all, and I wasted more time. See, my

attention span is almost through, and that's sad because I like writing. But this is...this is really hard because I'm just doing this from my head. I mean, it can't possibly be the best that it can be because I'm just thinking this and writing it. I'm just going along. I mean, how can this be right..."

Likewise, the first time she used the invention tutor was equally frustrating. She makes mistakes, just like her first week with word processing:

"[reading the screen] How much can it change before it's no longer rock music....a...[types] The beat must change. The beat must change. I messed that up. I hit return and I shouldn't have. Okay. Now we're going to try..."

Later that night, she gets tired and frustrated and says, in answer to the question, "Would you like some more randomly selected questions?"

"No. No more of that. [the screen changes in response to the "no" answer] Oh, I see how this works. [reads] Would you like to answer questions about rock music according to..."

That night she left a note on my desk with the printout she received of her answers to the heuristic probes saying, "Mr. Strickland, This didn't turn out very good. When I tried to start over again, it didn't work." A comparison of the printouts received after her first and second experience with the invention-tutor shows that these operational problems disappear by the second use (see Appendix). Perhaps we might best warn our writers that computers are going to be damn frustrating the first time, but after that, they're wonderful. This approach might be

more honest than testimonials.

Leslie did not ask for aid from the help screens on PC-Write, although I told her about the on-line help and noted the option on my one-page handout. She used the word-processing program as a glorified typewriter, missing out on the chance to revise and edit with features such as cut-and-paste or search-and-replace. The word-processing program had the capacity to tutor her in these techniques but was never given the chance. Finally at the end of the semester, I walked her through the help screens. Perhaps there is a certain amount of "hand holding" needed for every computer novice, regardless of on-line help, and a threshold to cross requiring a human teacher/tutor/lab assistant.

Leslie was more willing to ask for help when it was offered by the invention tutor. She easily followed the directions to bring up the screens. When consulted, they apparently seemed to answer her questions because she was usually able to answer the probes after reading the examples. Nevertheless, at one point, she said, "Well, that example is so much easier than [my topic] rock music." She also tried for a help screen where there was none; the system recorded as her answer the word she typed--"help"--and continued on with the program (see Appendix).

Rhetorical difficulties. Leslie needed help with invention strategies. Her first protocol revealed a basic writer's strategy for essay writing--looking in a dictionary:

> "Okay...Where do I start? Right now my mind's a blank and I have to think about what education is. I'll start with...well, education... knowing a lot about something. education is...no. If I had a dictionary I'd look up what

education is...."

As the semester went on, Leslie became competent at using the invention program but had difficulty seeing the material generated as raw material for an essay. The frustrations she experienced using QUEST the first time disappeared by the next time she used it, a pattern consistent with her experience of word-processing. Yet, her operational difficulties always had the potential of subverting her rhetorical attention. At one point, having successfully generated four answers to a rhetorical probe, Leslie's elation is immediately crushed because she hasn't entered the information the way the program expected it. She has to shift her attention to getting around in the program, going back and entering the answers the way the program wanted:

> "Now I can return; I did all 4. [reads] Feature #2. Oh wow! I messed this up, I think. Okay, now I've got to think of something else they do. I think I really messed this up. I don't know how to...I don't know how to go back. I know, you told me to go up. Oh, I see how they do it. Okay, I'm going to change this since I...because I left this out. Okay I'm going to go back and do this...Like feature #1, cleanse the body...beauty products...[reads] What features distinguish it from other things that are similar to it? ...Okay...Now where am I?"

While Leslie's use of word-processing continued throughout the semester, her use of the invention tutor peaked quickly. She didn't want to use it later in the semester, because, she told me, the exercise seems to slow down the draft production. One reason is that the heuristics demanded more time than she

wanted to give to the assignment. A second reason is that the heuristic results in a data file of answers to the probes and not a text file of sentences and paragraphs (see Appendix). As a result, she became competent at using the program as a discrete entity, but did not incorporate its process as part of her writing behavior. The question haunts us, how can we to convince writers that spending time with heuristic exercises, strategies that seem to postpone the production of the essay, will actually benefit a writing? Leslie was not conscious of the rhetorical effect of the invention-tutor's probe, but at one point, when stuck for a fourth answer, she reviews her previous answers to get an idea. This review, while slowing down her production, leads her to a top-level idea:

> "Beauty products a...[types] beauty products can...do...[stops] what nature left out. I know. They hide...whoa! They hide imperfections...[types] hide imperfections."

Although Leslie herself did not see the value in spending time with the invention exercises, I still believe they are helpful. I asked colleagues of mine at the University to judge the quality of the essays in a forced preference test. They chose the essay on beauty products, written after completing the heuristic exercise, over the essay on education, written after a series of freewritings. One of the reasons they gave for their choice was that the essay on education read like a freewriting while the essay on beauty products showed a reader-based organization (Flower, 1979). Leslie herself confirmed that she felt the essay on beauty products was a better essay, although it took longer to write. The obvious conclusion is that we need to

get past our students' initial reluctance to use these programs so that their writing may benefit from these computer tutors through long term use.

Diane Langston (1986) thinks we need new paradigm applications for the new technology. What I've been looking at are what she calls old paradigm exercises--pen and paper activities translated for the computer. But I have become convinced that we need to develop new paradigm tutors for a particular point in the composing process: after material has been generated and when the writer is trying to evaluate and revise. Our students do not have enough top-level goals and corresponding strategies to evaluate what they've produced. As a result, they transfer material wholesale. It's not so much that the freewriting resembles the final draft as that the writers have no other strategy. In my protocol study, I saw no examples of global revision, only lower-order local changes, usually at the level of word choice:

"people...instead of people...our society.";

"...bring out their good qualities...not good...their naturally attracting qualities."

This is consistent with what Colette Daiute (1986) found with the writers she studied: most revised by adding at the end rather than by global revision. Leslie's final essays show the need for tutoring at the reshaping stage when she needs to shift from writer-based to reader-based prose. Leslie does not realize that it took a session with the invention-tutor and many sessions of drafting to finally discover her issue:

"See, what I'm trying to get to is beauty products...how they change a person...I know this sounds weird, but I

understand how they change a person externally, but how it affects them internally. That's the major thing of this."

Our computer tutors, limited by the present state of technology, are unable to offer the type of "find and fix" strategies (Hayes, 1987) that writers need to evaluate their own work. During her first protocol, Leslie developed a long narrative about Len, her office manager, to illustrate her point about education:

> "[typing] I know a lot of people who are educated but who have absolutely no common sense. [stops typing] Right now, I'm thinking of this guy, and he had a Master's Degree, he was an accountant, I think...I mean, he talked...I mean, he was really educated...I mean, I know he went to school for a really long time, and his name was Len O---. And he was really smart, but I'll tell you, he was an idiot."

But the story did not appear in the text generated. A human tutor might have suggested including the story of Len, especially if the tutor heard the "top-level sentence" buried at the end of her two-minute narrative:

> "He was an idiot, but he was really educated. And that's one thing education is not; it does not make a person smart. I know a lot of people who are educated but have absolutely no common sense. And that's what I thought of when I thought of that person, because Len had no common sense."

Computer tutors are unable to make the kinds of suggestions that human tutors can. Computer tutors, new paradigm versions, need to be developed to tutor at the most critical point, reshaping and evaluating material, whether that material was generated by a freewriting or an invention heuristic.

Finally, we find a common ground between the confessions of writing teachers and the protocols of a student writer: "Word processing may prove to be of the greatest benefit to those who already know and understand their own writing process" (Davis, Bishop, & Smith, 1987, p. 11). Writing teachers and professional writers possess an understanding of rhetorical invention and strategies for meaningful revision; they are ready to understand writing in a new way--word processing. Student writers, on the other hand, are struggling to understand their own writing process. Leslie became increasingly aware of her own writing process. After writing with a computer for a semester, she had begun to be comfortable composing at the keyboard. Her writing began to show an awareness of plans:

> "I want [this essay] to be about how everyone uses beauty products and the effects of beauty products;
>
> "I would like to take a closer look at beauty products other than to examine the obvious;
>
> "I would like to focus on the effects that make-up have on certain people."

Her writing began to show an awareness of the conventions of print:

> "The effects range from cleanliness, an outer appearance - comma- [explicitly creating a free noun phrase]...the effects range from cleanliness, an outer appearance, to inner fulfillment of confidence;
>
> "...a dirty old man into a clean...maybe I'd better put dirty in ... quotations" [recognizing the multiple layers of meaning the quotes create: an unkempt old man and a dirty old man.]

As a stimulant to generate new text, she continued her practice

of re-reading what she had already typed, but her writing also began to exhibit a working towards the making of meaning:

> "I have actually...I have actually heard a sour...let's see. I have actually witnessed [choosing a stronger, more accurate verb] beauty products turning a woman with a sour...turn a sour-faced woman into a...I have actually witnessed beauty products...beauty products turning a sour-faced woman into...into a...witnessed beauty products turning a sour-faced woman into a radiant...a radiant...a radiant, self-...self-fulfilled woman. Okay. They are unsure of their ability to make proper decisions. I have actually witnessed beauty products turning a sour-faced woman into a radiant...radiant, self-fulfilled ...radiant...radiant, shiny...a radiant, [still struggling with meaning, deletes the radiant-shiny connection] self-fulfilled woman."

The computer facilitates the growth that I witnessed in Leslie's protocols but the learner should receive credit for the learning, not the tutor. Leslie's "conversion" to the computer, like that experienced by professional writers, signifies the development of a writer's consciousness, not the intervention of a deity. If we need more testimonials about the saving grace of computers, I believe we need to hear the protocols of writers struggling in the process of becoming.

[1]I wish to thank my colleague, Diana Dreyer, for her comments on earlier drafts of this manuscript.

Works Cited

Autry, K. (1985). Printout: A review of two new books. Computers and Composition, 3,(1), 71-76.

Brown, J. S., & Burton, R. R. (1975). Multiple representation of knowledge for tutorial reasoning, In D. G. Bobrow & A. Collins (Eds.), Representation and understanding: Studies in cognitive science (p.324), New York: Academic Press.

Burns, H. L. Jr. (1979). Stimulating rhetorical invention in English composition through computer assisted instruction. University of Texas at Austin. Eric Document Reproduction Service ED 188 245.

Daiute, C. (1986). Physical and cognitive factors in revising, Research in the Teaching of English, 20,(2), 141-159.

Davis, K., Bishop, W., & Smith, P. (1987). Composing at the word processor: Confessions and comment. (Unpublished manuscript)

Etchison, C. (1985). A comparative study of the quality and syntax of composition by first year college students using handwriting and word-processing. Indiana University of Pennsylvania, 1985. DAI. 47, 01A.

Flower, L. (1979). Writer-based prose: A cognitive basis for problems in writing. College English, 41, 19-37.

Flower, L., & Hayes, J. R. (1981). A cognitive process theory of writing. College Composition and Communication, 32, 365-387.

Hayes, J. R. (1987, March). Recognizing cues to action. Paper presented at the Conference of College Composition and Communication, Atlanta.

Kemp, F. (1987). The user-friendly fallacy. College Composition and Communication, 38, 32-39.

Langston, M. D. (1986, March). New paradigms for computer aids to invention. Paper presented at the Conference of College Composition and Communication, New Orleans.

Schwartz, H. J. (1982, March). A computer program for invention and feedback. Paper presented at the Conference of College Composition and Communication, San Francisco. ERIC Document Reproduction Service, No. ED 214 177.

Strickland, K. J. (1984). A comparative study of systematic and unsystematic heuristic strategies in computer-assisted instruction and traditional instruction. Indiana University of Pennsylvania. DAI, 45, 2749A.

Appendix

Printout from QUEST following Protocol #4

"11-4-86" "Honey",

ROCK MUSIC

THERE IS DISCONTENT IN YOUNG PEOPLE.

EVERYONE IS LOOKING FOR SOMETHING DIFFERENT.

THERE IS ALOT OF COMPETITION AND MUSICAL ADVANCEMENT LEADS WAY TO AN EVEN HARDER TYPE OF ROCK

HELP

LOUD , IT IS RADICAL , CONTRASTED TO EASY LISTENING. EXAMPLE CLASSICAL MUSIC, IT IS HARD TO UNDERSTAND SOMETIMES.

Printout from QUEST following Protocol #5

"11-11-86" "LESLIE"

BEAUTY PRODUCTS

SCIENTIFICALLY SPEAKING BEAUTY PRODUCTS WEREN'T AS GOOD AS THEY ARE TODAY.

IN THE PAST RESEARCH WASN'T AS ADVANCED. LIFESTYLES AND EATING HABITS HAS MAKE SKIN PROBLEMS AND AGING MORE OF A CONCERN NOW THEN IT DID YEARS AGO

MORE COMPETIVE SINCE THE MEDIA IS PUSHING EVERYONE TO BELIEVE THAT LOOKING YOUNGER IS THE KEY TO A HAPPY LIFE. EVERYWHERE YOU LOOK PEOPLE ARE LOOKING FOR THE MAGIC FORMULA.

THE PUBLIC CRIES FOR AN ANSWER TO THEIR BEAUTY NEED. BEFORE THEY ARE MARKETED THEY MUST BE TESTED AND PROVED SAFE.

THEIR IS USUALLY A STORY BEHIND HOW A FORMULA WAS DISCOVED AND PROVED SUCCESSFUL.

HAIR PRODUCTS ARE A NECESSITY FOR GENERAL HAIR CLEANSING. BEAUTY PRODUCTS REDUCE DISEASES CAUSED BY UNCLEANSINESS. CLEANSES THE BODY

BEAUTY PRODUCTS MAKE A PERSON FEEL BETTER. THEY ULTIMATELY MAKE THEM ACT BETTER BECAUSE THEY FEEL BETTER. THEY PROTECT AND KEEP THE SKIN FROM AGING. BEAUTY PRODUCTS CAN, DO, HIDE IMPERFECTIONS. THEY CAN DO WHAT NATURE DIDN'T. IF USED THE RIGHT WAY BEAUTY PRODUCTS CAN ENHANCE A PERSONS NATURAL BEAUTY.

BEAUTY PRODUCTS CAN MAKE A PERSON FEEL BETTER ABOUT THEMSELVES. IF A PERSON IS SAD IF THEY CLEAN THEMSELVES UP A PUT ON SOME MAKEUP 9 TIMES OUT OF TEN THEY WILL PORTRAY AN ATTITUDE OF SELF CONFIDENCE.

(WOMEN IN GENERAL),KEEPS THE SKIN FROM DRYING OUT AND SHOWING SIGNS OF AGING. DEPENDING ON A PERSONS SKIN TYPE THEY CAN USE PRODUCTS THAT ARE DESIGNED TO REDUCE THE NATURALAGING PROCESS. YOUR SKIN IS LIKE ANYTHING ELSE IT WEARS OUT IN A MATTER OF TIME

SKIN CARE,BODY CARE,HAIR CARE,GLAMOUR

BEAUTY PRODUCTS GENERATE A LOT OF INCOME BEAUTY PRODUCTS COME IN MANY FORMS AND MANY PRICES. IT WORKS ON SUPPLY AND DEMAND

EVERYONE USES BEAUTY PRODUCTS TO A CERTAIN DEGREE BEAUTY PRODUCTS CAN NOT BE KEPT. THEY ARE USED UP SO AS FAR AS MONEY GOES, TO SOME PEOPLE THEY AREN'T A GOOD INVESTMENT.

THEY INITIATE SELF WORTH. THEY CLASSIFY PEOPLE. BEAUTY PRODUCTS ARE SEEN WITH THE HUMAN EYE IMMEDIATELY UPON MEETING OR PASSING BY SOMEONE.